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28 August 1980

East Europe Report

SCIENTIFIC AFFAIRS

No. 681

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RADIANT FLUX MEASURING ON PLASMATRONE DISCHARGE CHAMBER WALLS

Prague STROJIRENSTVI in Czech May 80 No 5 pp 304-307

[Article by Engineer K. Schovanec, candidate for doctor of science, Prague: "Experimental Research of Radiation in the Discharge Chamber of a Plasmatrone"]

[Text] The author familiarizes his readers in detail with a system for measuring radiant fluxes on the walls of a plasmatrone discharge chamber at temperatures ranging along the axis of the arc between 10,000 to 11,000 Kelvins and presents the results of the measurements during selected stages of plasmatrone operation characterized by electric current values of 50, 100 and 150 amperes, together with an explanatory commentary. He monitors the dependency of radiant flux density on the distance from the cathode and on the amount of argon passing through the discharge chamber.

1. Introduction

This article presents selected results of studies conducted by the Institute of Thermomechanics of the Czechoslovak Academy of Sciences and dealing with examination of processes in the discharge chamber of a plasmatrone. These studies follow up research into the properties of free flux of argon plasma [1], generated by a laboratory plasmatrone of the 100-volt type developed by the institute as a source of high temperature gas [2]. It is obvious that the properties of free flux of plasma depend on the processes taking place in the plasmatrone discharge chamber which are determined by the manner in which operational gas bypasses the electric arc column. This determines the configuration of the arc column as well as energy transfer from the arc into the operational gas and heat transfer into the discharge chamber walls, or their chronological progress. This makes the study of the processes inside the discharge chamber of key importance. An integral part of such research is measurement of heat transfer and its radiant component. This problem has been dealt with by a number of authors, e.g.,[3]. Nevertheless, the results of their studies could not be applied for our purposes in view of the fact that they were arrived at using plasmatrones with a different geometry of the discharge chamber and arc stabilization. In addition, their results represent median time values for corresponding variables, determined largely by sensors with large time constants. Thus, we made our own measurements using a suitable diagnostic method [4] on a plasmatron variant developed for this purpose on the basis of the 100-volt type.

2. Measuring System

2.1 Plasmatrone

As already mentioned, a plasmatrone facilitating measurements in its discharge chamber was developed on the basis of the 100-volt type, bearing the designation 100 V3 [4]. A sectional view of the plasmatrone is depicted in illustration 1. The plasmatrone has a bar type, water-cooled main cathode

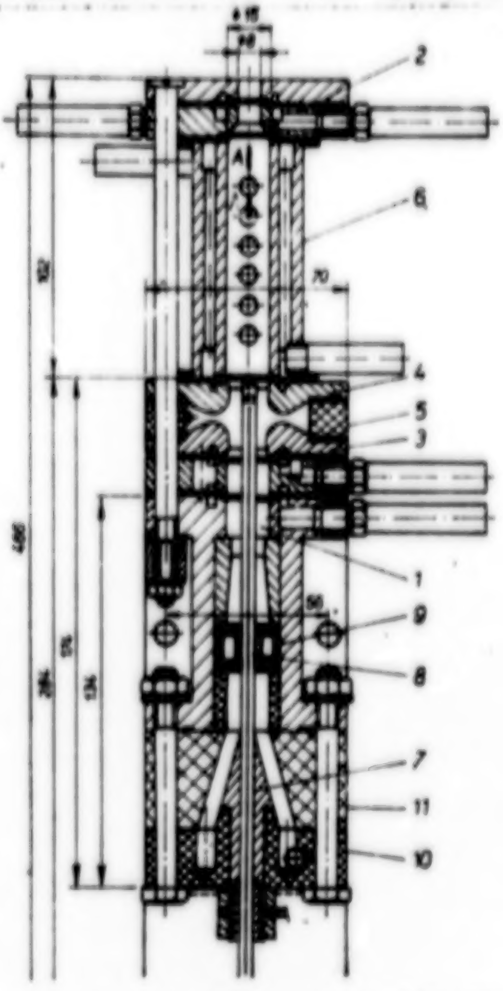

Figure 1. Plasmatrone 100 V3

of 8 millimeters diameter with a brazed tip of thoriated tungsten provided with a stabilizing bore 1. The main anode 2 is formed by a water-cooled copper ring. Auxiliary electrodes -- cathode 3 and anode 4 -- used for plasmatrone run-up, are also made of copper and water-cooled. They are interspersed by an umatex insert 5 with two tangential ports 2 millimeters in diameter for argon supply. In this manner, the auxiliary electrodes and the umatex insert form a turbulent chamber. The discharge chamber can be formed either by three copper cylinder blocks, or a single block (see 6 in illustration 1). In the measurements, the results of which are presented herein, we used three blocks. The discharge and turbulent chambers maintain the same geometry as do all the other variants of the basic 100-volt type. The discharge chamber walls are cooled by water by means of a series of axial channels distributed along the circumference on the chamber and connected at the discharge chamber ends by annual collecting grooves. The wall of the discharge chamber contains a total of 12 apertures for probing, located at opposite ends in two rows of six each. Main cathode 1 may be adjusted along the guideway 7 and 8, thus modifying the length of the arc. In addition to tangential feed of argon into the turbulent chamber, argon can also be fed axially by the distributor 10.

2.2 System for Measuring Radiation in the Discharge Chamber

The system measures overall radiation within the range of wavelengths given by the material of the selected optics which impinges on the wall of the plasmatron's discharge chamber. Its concept is depicted by figure 2. In the probing aperture in the discharge chamber wall is an extension 1, held

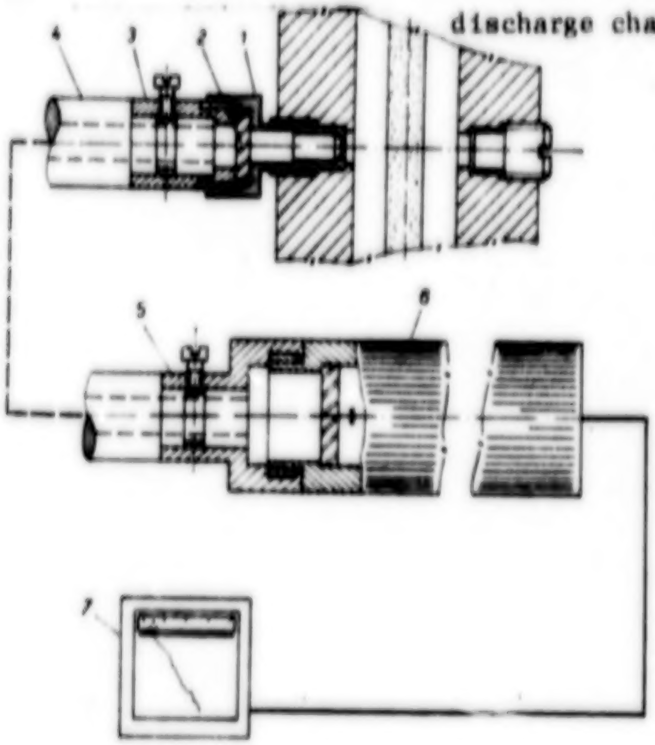

Figure 2. System for Measuring Radiation in the Discharge Chamber

by screws and its face formed by a diaphragm. Inserted into the extension is a safety window 2 made of fused quartz -- melting temperature 1,710 degrees Celsius -- and a screw-held coupling 3 for insertion of the lightguide 4. The lightguide used was a flexible light-conducting cable of the C. Zeiss company 1,000 millimeters long with a spring bushing and plastic casing. The cable terminals are provided with pin plugs. The maximum lighting aperture of the cable is approximately 30 degrees and permeability, according to the manufacturer's data, is on the order of $\tau = 0.36$. At the output end of the lightguide is inserted a connector 5 terminated by a thread for screwing on the radiation sensor 6. The radiation sensor used was a vacuum thermocouple type VTh 5 of the C. Zeiss company, provided with a protective window made of potassium bromide. Its sensitivity was 23.5 V/W and the reception area used measured 0.5 millimeters by 1.2 mm = 0.6 square millimeters at 220 ohms resistance, time constant of the thermocouple VTh 5 was about 100 ms.

The signal from the thermocouple was fed into the recorder 7 represented by an electron-tube linear compensation recorder EZ 10 of the national enterprise Laboratory Instruments. It is a very sensitive instrument with a number of measuring ranges from 100 microvolts to 5 millivolts, with an accuracy of 0.2 percent plus or minus 1 microvolt and zero stability of plus or minus 1 microvolt.

3. Measurement Results

Theoretical analysis of the problem of determining the radiant flux impinging on the discharge chamber wall, described in detail by [5], pointed toward selecting an experimental method. To clarify the complexity of this problem, let us outline at least briefly the basic facts. Stationary heat exchange by radiation constitutes here an open system consisting of a cylindrical discharge chamber, the walls of which have a generally unbalanced heat distribution and radiate jointly and, in most cases, diffusely, and a gaseous medium inside the discharge chamber represented by an arc column bypassed by argon, the temperature of which is the function of position and the flux spectrum consisting of lines and a continuum. Radiation of the gaseous medium, which itself is absorptive, is partially absorbed, partially reflected--in most cases diffusely--by the chamber walls. In addition, the discharge chamber walls absorb and reflect their own radiation. Nonstationary heat exchange inside the discharge chamber, where we encounter time as an additional variable, is even more complex. The presence of the remaining components of heat exchange constitutes an additional complicating factor. From the above it is thus obvious that a reliable determination of the radiant flux impinging on the discharge chamber wall based on calculation offers no advantage, and that the task may be solved more expediently and more easily by the experimental method we selected which uses the measurement instrumentation described in subparagraph 2.2.

The system depicted in Figure 2 theoretically receives radiation from the cone with an apex angle of $\measuredangle = 26$ degrees. This is given by the diameter of the inlet diaphragm and the inlet diameter of the lightguide. Extension 1 (Figure 2) is of course also penetrated by additional radiation which becomes multiply reflected on its inner walls, mostly in a diffuse manner. It can be assumed that the lightguide is actually exposed to radiation from the cone with an apex angle of $\chi' = 139$ degrees. The following applies to radiant flux impinging on the reception area of the sensor

$$Q = b_2 F_s \frac{F}{l^2}, \qquad (1)$$

wherein

b_2--radiation at the output crosses section of the lightguide,

F_s--ara of the output cross section of the lightguide,

F--reception area of the sensor and 1 the distance between the area of the output cross section of the lightguide and the reception area of the sensor.

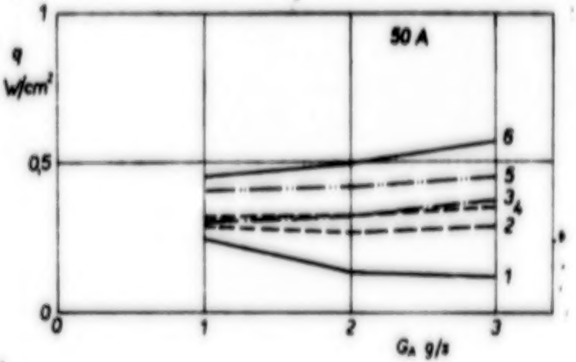

Figure 3. Density of Radiant Flux in Individual Probing Ports in Relation to the Rate of Flow of Agron at Current Intensity of 50 Amperes.

Further applies

$$b_2 = b_1 \tau_1 \tau_2, \qquad (2)$$

wherein

b_1--radiation determined by radiation of the area of the input diaphragm in the extension and the walls of its hollow part,

$\tau_1 \doteq 0.90$ permeability of the extension's protective window (fused quartz) and

$\tau_2 \doteq 0.36$ permeability of the lightguide.

Finally, by substituting (2) into (1) we arrive at

$$Q = b_1\tau_1\tau_2F_1\frac{F}{l^2}. \qquad (3)$$

From equation (3) we can determine b_1, whereby Q is given by the sensor signal. By means of value b_1 we can, assuming the validity of the relation

$$q = \pi b_1 \qquad (4)$$

determine the radiation impinging on unit area of the discharge chamber wall per unit of time from half space--density of radiant flux--in wavelength internal λ = 0.3-2.5 micrometer given by the material of which the lightguide is made. Figures 3, 4, 5 show the dependency of radiant flux density in probing ports 1 through 6--numbering in the direction from cathode to anode--in the discharge chamber wall of the plasmatron 100 V3 on the rate of flow of argon at electric current intensities of 50, 100 and 150 amperes, at basic arc length of 127 millimeters, which corresponds to the distance between the tip of the main cathode and the front of plasmatron of 141 millimeters, at tangential feed or argon.

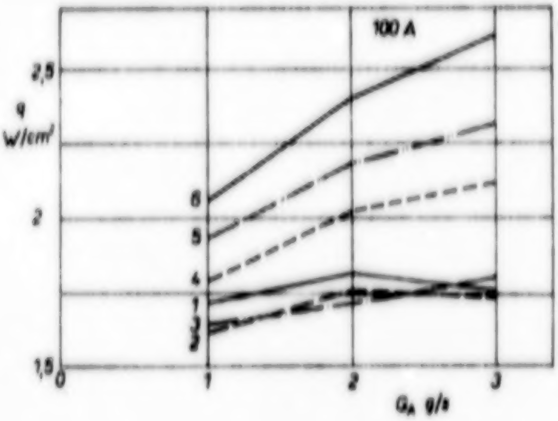

Figure 4. Density of Radiant Flux in Individual Probing Ports in Relation to Rate of Flow of Argon at a Current Intensity of 100 Amperes

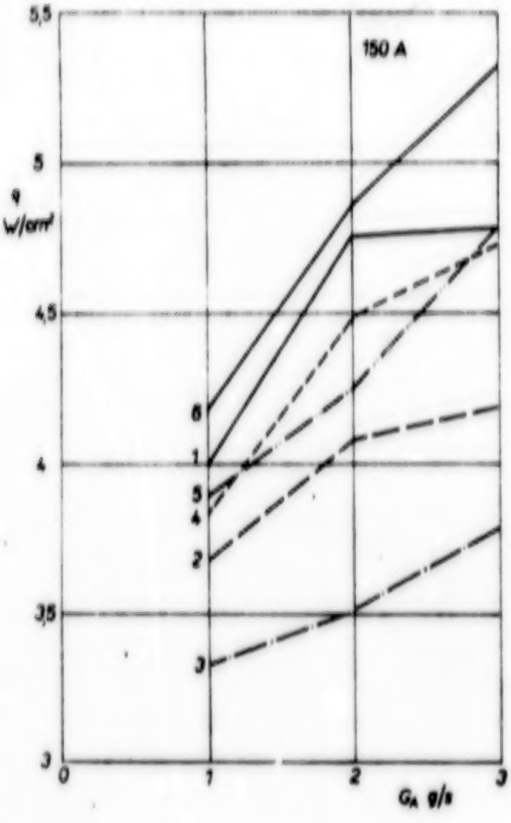

Figure 5. Density of Radiant Flux in Individual Probing Ports in Relation to Rate of Flow of Argon at the Current Intensity of 150 Amperes

Figures 6, 7, 8 show the progression of radiant flux density along the discharge chamber wall at varying electric current intensities for argon rate of flow of 1.0 g/s, 2.0 g/s and 3.0 g/s. It should be pointed out that the relations appearing in the figures were arrived at by connecting points representing the median time values of the corresponding variables determined from the recorder readout.

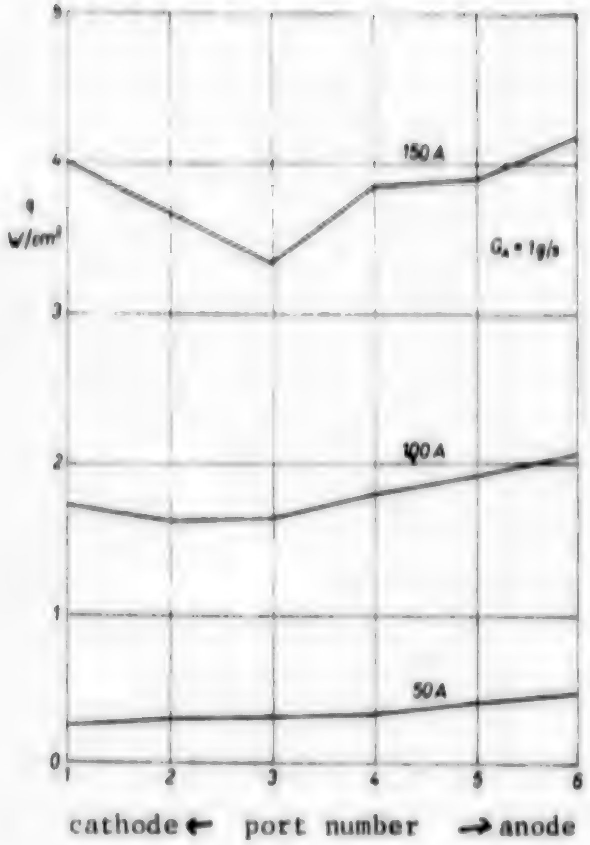

Figure 6. Radiant Flux Density Distribution Along Discharge Chamber Wall at Current Intensities of 50, 100 and 150 Amperes for Argon Rate of Flow of 1.0 g/s

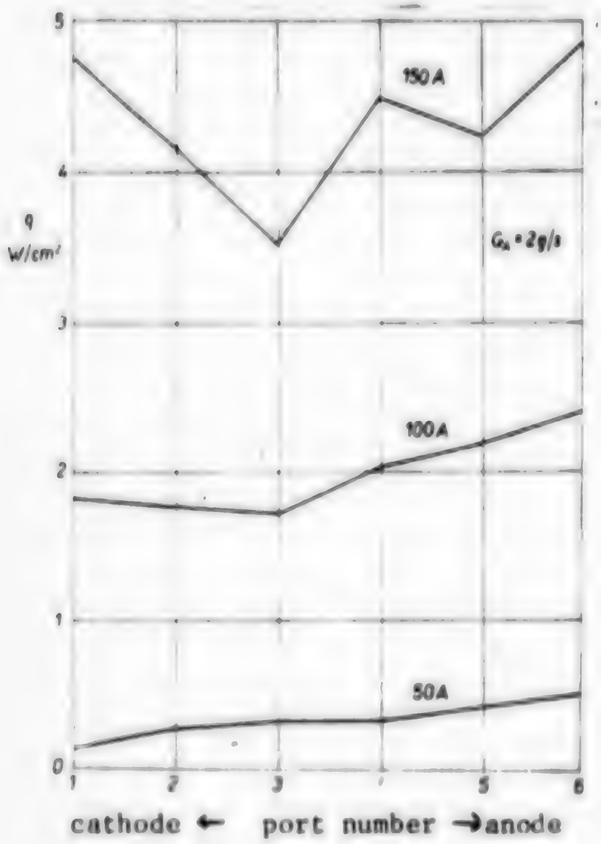

Figure 7. Radiant Flux Density Distribution Along Discharge Chamber Wall at Current Intensities of 50, 100 and 150 Amperes for Argon Rate of Flow of 2.0 g/s

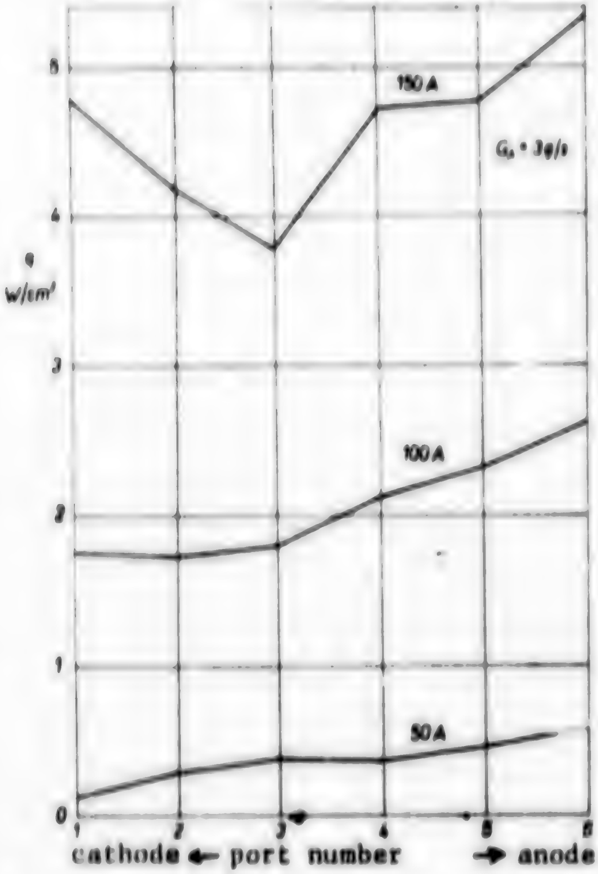

Figure 8. Radiant Flux Density Distribution Along Discharge Chamber Wall at Current Intensities of 50, 100 and 150 Amperes for Argon Rate of Flow of 3.0 g/s

Figures 3, 4, 5 clearly indicate that radiant flux density pronouncedly increases with higher intensity of electric current, which is due to temperature increase in the arc column as the current intensity increases. Effects of the rate of flow are not quite so conspicuous. As shown by figures 3, 4, 5 radiant flux density becomes more apparent only with higher electric current intensities (100 and 150 amperes), differently in individual probing ports. A pronounced increase becomes manifest primarily in the probing ports in close proximity to the main anode. This is due to a decrease in the diameter of the arc and rise in temperature in the axis of the arc column.

Radiant flux density distribution shown in figure 6, 7, 8 is commonly characterized for all measures rates of argon flow by the fact that radiant flux density increases with proximity to the anode. At lower currents (50 amperes), radiant flux density distribution increases evenly in the direction of the main anode. At 100 ampere current there appears a tendency for minimal progress of radiant flux density in the area of the probing port 3, which becomes distinctly manifest at 150 ampere current. The potential reason for this minimum may be a change in the field of flux of argon bypassing the arc columns and the resultant decrease in the temperature in the corresponding cross section of the discharge chamber. It should be noted that a transition zone must be present in the discharge chamber to stabilize the flow of argon once it has left the turbulent chamber.

4. Conclusion

This article described the experimental system designed for determining radiant flux on the wall of the discharge chamber of a plasmatrone developed by the Institute of Thermomechanics of the Czechoslovak Academy of Sciences. Measurements were made on plasmatrone 100 V3 with tangential argon input for an arc length of 127 millimeters. Densities of radiant flux on the discharge chamber wall ranged on the order of 10^{-1}-10^{0} W/cm^2 for wavelength regions of λ = 0.3-2.5 micrometer at electric current intensities of 50-150 amperes and argon rates of flow of 1-3 g/s. It was determined that radiant flux density increases significantly with electric current, while its growth with the rate of flow of argon is not quite as pronounced. The progress of radiant flux density along the discharge chamber wall at increasing electric current intensity is more and more pronouncedly characterized by a minimum in close proximity to the turbulent chamber. This minimum points our changes occurring in the hydrodynamic structure of argon flow in the discharge chamber. On the other hand, at lower intensity currents, when the minimum is not quite so apparent, the progress of radiant flux density is even, slightly increasing in the direction of the main anode.

In conclusion it should be pointed out that all measured relations apply to the geometry of a discharge chamber and operational conditions specified at the opening of this chapter. An attempt at generalizing these relationships will require further measurements of radiant flux density on discharge chamber wall in order to identify other influencing factors, such as the effects of arc length and the manner of argon feed.

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8204
CSO: 2402

HUNGARY

COMPUTER, AUTOMATION KNOW-HOW EXPORT

Budapest NEPSZAVA in Hungarian 29 Jul 80 p 3

[Article by M. M.: "Knowledge Export; From Czechoslovakia to India; Foreign Exchange Source"]

[Text] The export successes of some of our machine industry enterprises can be judged not only from how many orders they have but also by the nationality and number of students coming here for further training. It is now natural for anyone purchasing complex manufacturing lines or equipment to buy the know-how needed to operate it also. In general high level training for operating personnel is included in the price.

Many are now interested in the computers being produced by Videoton in Szekesfehervar. In 1976, 200 experts arrived here for the purpose of mastering what was needed to operate Videoton products; in "school year" 1979-1980 there were almost 700. Most of them, 400, came from Czechoslovakia. The international spread of the R-10 and especially the R-11 computers is shown by the fact that students also come from distant countries which essentially belong to the hunting ground of the American IBM firm. Most recently, for example, two computer experts from India participated in the further training course, which averages 100 hours of instruction, but the students also included the son of an oil sheik who is interested in technology. The most recent business successes of the enterprise can also be measured by the fact that almost 800 foreigners have applied for the study courses in the next instruction year.

Most of the students of Videoton equipment come here but the majority of the machine industry enterprises must provide high level training in the purchasing country, at the place the equipment is used. Naturally this is no problem either. Experts with the required language knowledge are teaching the foreign customers in several countries. There are about as many in the surrounding socialist countries as there are in Hungary studying the operation and maintenance of the transmission technology equipment of the Telephone Factory, the surveying systems of the MMG [Measuring Instruments Factory] Automatics Works and the products of the Metripond Balance Factory.

Teaching the foreigners is actually intellectual export. It is the most economical way to earn foreign exchange. Of course, if the national economy is to earn more in this way then the enterprises will have to sell ever more and more modern equipment abroad.

8984
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HUNGARY

PROSTAGLANDIN SYNTHESIS, USE IN HUMAN, VETERINARY MEDICINE

Budapest NEPSZAVA in Hungarian 29 Jul 80 p 3

[Article by Sandor Stuber: "Ten Years of Prostaglandin; More Expensive than Gold"]

[Text] The domestic papers reported about the wonder drug more expensive than gold in sensational reports 10 years ago; and it came up again this week at a world biology congress held in Budapest. The subject is prostaglandin, an especially active family of compounds from living tissues. This substance, which influences the functioning of the central nervous system and the entire propagation mechanism, was first successfully isolated at the end of the 1950's by Professor Berstrom in Stockholm--he obtained a few milligrams of prostaglandin from 100,000 sheep.

The race which started to synthesize the substance was won in 1968 by the American Upjohn group and research began here 2 years later thanks to Chinoin and the Budapest Technical University. Did the hopes attached to the production and use of prostaglandin prove themselves?

"We produced our first gram of prostaglandin in 1972 after strenuous work. We were preceded only by Upjohn and the world famous Japanese Ono firm," reported Dr Gabor Kovacs, chief of the chemical research main department at Chinoin. "Four years later we worked out a new, more modern and more economical synthesis on the basis of an idea of chemist Istvan Tomoskozi. As a result of this extraordinary scientific achievement it became possible for the first time for our pharmaceutical industry to play a crucial role on the world market. The registering procedures of the Enzaprost-F injection are used in the most developed western countries and there is interest in South America and Australia."

For the time being manufacture takes place only in an experimental plant but according to the plans a medium plant will be built in 2 years and then the Enzaprost-F will begin to play a significant role in the commerical trade of the factory. But this is not the concern of the researchers.

"We are watching the fate of the substance. All the more so because the hopes attached to it have not yet proven themselves in the treatment of humans. It is the best tool to terminate a 3-6 month pregnancy even now but experiments are continuing on its use in other areas."

But the introduction of Enzaprost-F was a triumph in veterinary medicine. Its use permits the control and synchronization of sexual maturity and the occurrence of births and there are encouraging experiments in the elimination of sterility. All of this is of extraordinary significance in large scale animal husbandry.

In the meantime, in 1977, there was another turning point in prostaglandin research. With a few weeks difference they reported at three different points on earth the production of Prostacyclin. One of these points was Budapest.

"This type of the natural prostaglandins is the best blood clotting inhibitor and blood-vessel dilator known so far and in addition it is effective in extraordinarily small doses," said Dr Gabor Kovacs. "Its significance is gigantic because, as in many countries, circulatory disorders have first place here among the causes of death. Our medicine has been prepared; clinical tests will now follow. Meanwhile the development of research techniques is making possible the study of more and more types of prostaglandin. We are dealing with the modifications of the arachidon acid, a subject of increased research interest around the world. It has been shown that these compounds play a role, among other things, in the development of asthma and gastric ulcers. Our research results are encouraging."

Prostaglandin figures among the nine strategic products designated by Chinoin for the turn of the century. The medicines which have been created are modern and represent a "background industry" more developed than the real one. As a result of the research of the past decade it has been proven that they can reach the world level. Of course, not always and everywhere, but certainly in some areas.

Making use of the sure traditions plus concentrating research resources. This is the Chinoin method.

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UDC: 531.77:531.38:621.3.087.92:681.32:681.33

OPTOELECTRONIC ANALOG-TO-DIGITAL CONVERTERS

Budapest MERES ES AUTOMATIKA in Hungarian Vol 28 No 5, 1980 pp 193-197

ERODI (MRS NADORFI), ERZSEBET, Research Institute for the Instrument Industry

[Abstract] Angular displacement encoders into digital signals from the Research Institute for the Instrument Industry are described. The encoders operate on the basis of the non-contact scanning principle (thus eliminating contact faults) and provide high resolution (as a result of the low torque required for the rotation of the code-carrying disk), they are reliable and have a long service life. The light source and the optical system are on one side of the disk, and the photosensors (phototransistors) are on the other side. An incandescent or GaAs infrared lamp is the light source. The GaAs diode is preferable in systems with few channels. Incremental and absolute angular-position encoders are available. The latter have the advantage that the information is saved if there is power failure, that the device is not sensitive to interference, and that it operates even if there is a relatively long distance between the encoder and the decoder; their disadvantage is that measurement of angles over 360 degrees is difficult (mechanical attachments are required), that the device is complex (special coding disks and multiple wires are required because of the several channels), and that the evaluator is more elaborate. Incremental devices are preferred for numerical machine-tool control; aircraft navigation systems; measurement of velocity, pressure, and momentum; speed-control systems; geophysical systems; x-y coordinate table positioning, and so forth; absolute devices are preferred in scales, radar localization, and leveling systems. The devices now available utilize the experience of the Research Institute for the Instrument Industry collected over a 10-year period. Figures 10. [97-2542]

CSO: 2502

UDC: 681.326.7:621.398

THE MULTIMICROPROCESSOR SYSTEM AND ITS USE AS A TELEMECHANICAL CENTER

Budapest MERES ES AUTOMATIKA in Hungarian Vol 28 No 5, 1980 pp 198-201

MOSO, TAMAS; and SZABO, ISTVAN, Mechanical Measuring Instruments Factory (MMG) - AM [Automation Department]

[Abstract] The multimicroprocessor system described is based on a fixed programmed hardware center, and MMG - AM and INTEL 8085 microprocessors. It permits tasks to be carried out in a true (not virtual) parallel manner, it is highly reliable, and may be flexibly designed for the realization of tasks of various degrees of sophistication. It is a hierarchical system: a supraordinate microprocessor coordinates the operation of the system, while information exchange between the microprocessors takes place through an easily accessible joint memory. Multiple access is controlled with special hardware, and the monitor processor is capable of exchanging information with all other microprocessors. The system is of the "open" type, of modular design. A special real-time monitor controls the operation of the software. The monitor runs in a processor of its own, although parts (such as call-administration routines and a scheduler) are included in each subordinate microprocessor. When the system is used as a telemechanical center, each microprocessor realizes defined functions; the system as such performs acquisition of remote data, processes the acquired data, utilizes the data, and performs any required system modification. The following programs exist in the individual microprocessors: monitoring, telegraphing, arithmetic operations, interface functions, display functions, and specialized functions for the intended application (such as in control systems for gas and oil pipelines). Provisions exist for expansion with floppy-disk drives. The system is primarily suitable in applications where single-processor systems are inadequate (for example, because of insufficient computation or memory capacity) and process-control minicomputers are unsuitable because of economic considerations. Figures 3; references 4: 1 Russian; 1 Czechoslovak; 1 Hungarian, and 1 Western. [97-2542]

CSO: 2302

APPLICATION OF PLASMA ETCHING IN THE MANUFACTURING TECHNOLOGY OF INTEGRATED CIRCUITS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian Vol 19 No 4, Apr 80
pp 108-110

VALYI, GEZA and Mrs. SCHILLER, ROBERT, Central Physics Research Laboratory, Hungary Academy of Sciences

[Abstract] Methods and equipment for the plasma etching of photographic coatings, silicon, silicon nitride and silicon dioxide are briefly described. The method used in the authors' laboratory employs a cylindrical electrode, used in a PSD/PDE-301 device made by the LFE company. The gas used for etching away the photographic coating contains oxygen, neutral gases and small amounts of carbon tetrafluoride; the gas used to etch silicon nitride and silicon dioxide contains carbon tetrafluoride, oxygen, neutral gases and hydrogen. Tests were carried out in order to establish the etching rate of silicon dioxide and silicon nitride as a function of power, pressure and number of slices, and also to assess the homogeneity of the etching. The etching process was monitored by emission spectroscopy (with the 483.5 nm CO line or the 704 nm fluorine line). Photographic-coating removal was monitored with the aid of the 483.5 nm CO line. A new method was developed to indicate the end point for all processes studied. The use of this method makes the etching process more efficient. Figures 8. [99-2542]

CSO: 2502

RESISTANCE-HEATED VACUUM FURNACE FOR SPACELAB

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian Vol 19 No 4, Apr 80
pp 115-116

HUGO, FRANZ, Leybold-Heraeus GmbH, Hanau, West Germany

[Abstract] A resistance-heated furnace, designed for use in the materials-technology laboratory unit of a European Spacelab experiment, is briefly described. The unit weighs 32 kg, and has overall dimensions of 450 by 610 by 350 mm. Maximum heat loss at a working-space temperature of 1600°C is 230 W. The operating temperature may be adjusted between 200 and 1600°C, the isothermal zone is 100 mm long with a diameter of 40 mm. The temperature is constant to within 0.5°C. The heating-up rate is 60°C/min, and the cooling rate from 1250 to 45°C is 120°C/min. The maximum cooling-water consumption is 30 liters/hour, and the maximum pressure loss in the cooling system is 0.15 bar. The heating oven is on a carriage, and may be moved axially. The maximum gap between the test sample and the heating source is 0.5 mm since under the high operating vacuum involved, heat transfer takes place only via radiation and convection. A special device is used to permit quick sample changing. Safety units prevent accidents by touching hot surfaces. The furnace, developed at Leybold-Heraeus GmbH, complies with all applicable provisions of the standards for space flights. It is expected to be used in space experiments with materials of construction. Figures 5. [99-2542]

CSO: 2502

WAFER SCORERS FOR MICROCIRCUITS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian Vol 19 No 4, Apr 80 pp 102-107

FABENYI, EDE, graduate mechanical engineer; and MIKLOSI, JANOS, graduate mechanical engineer, Research Institute for the Communications-Technological Industry, Special-Equipment Designing Department

[Abstract] Industrial-quality diamond is used to score wafers for microcircuits. The diamond is faceted and fitted into a handle. Most diamond scorers have four edges, and the pressure employed in scoring is 5-20 grams, depending on the substrate being scored. The Research Institute for the Communications-Technological Industry developed three scoring devices. The EK-82 is manually operated, and intended for accurate cutting of substrates for thin-layer and hybrid circuits. The EGY-69 is pneumatically operated, and can handle sizes up to 100 by 100 mm. The EK-160 is intended to score solid-state, glass and ceramic substrates. In the latter model, the table moves, while in the others the diamond scorer moves relative to the table. All devices feature positioning and monitoring units for accurate scoring and to facilitate operation. The devices are illustrated with photographs and drawings, and photomicrographs of scored lines and diamond facets are shown. Figures 18, references 3: 1 German and 2 Hungarian. [99-2542]

CSO: 2502

EXPERIMENTAL STUDY AND NUMERICAL MODELING OF THE ETCHED PROFILE OF LAYERS USED IN SOLID-STATE TECHNOLOGY

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian Vol 19 No 4, Apr 80
pp 111-114

BALOG, GEZA, scientific assistant; DEVENYI, NORA, scientific assistant; and PERTL, FERENC, scientific assistant, Research Institute of the Communications-Technological Industry

[Abstract] The etching profiles were studied with the aid of scanning electron microscopy, using cross-sectional specimens. A system of parallel lines is established along the sample by means of photolithography. After the etching the sample is scored with diamond on the rear surface and broken. In this way the layer examined remains intact and a cross-sectional surface perpendicular to the lines is obtained. Aluminum layers, thermal SiO_2 layers, and other structures obtained by etching were examined. The methods available for modeling the etching processes are the cell method, the gradient method and the chain method. The authors describe a modified chain method for modeling homogeneous and isotropic etching processes. The method provided models which satisfactorily characterized the aluminum and silicon dioxide layers as shown by their electron micrographs. The method may also be used to study more complex etching processes and coatings, as well as interruptions in the metal network. Figures 8, references: 8 Western. [99-2542]

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UDC: 621.372.852:669.15'24.018.472:621.357.7

GALVANIC FINISHING OF FILTER COMPONENTS OF MICROWAVE SYSTEMS MADE OF INVAR

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BAJOR, ANDRAS, dr., and FARKAS, SANDOR, ORION

[Abstract] A process is described for imparting superior corrosion resistance and applying a silver top layer to filter parts made of Invar (FeNi36), including parts with 150-200 mm long cavities of small cross section. Corrosion resistance is obtained by a nickel-copper layer on the surface, and the silver layer is deposited onto this. The parts are prepared by degreasing, oxide removal and sandblasting. Then they are galvanized with copper from a cyanide bath after activation with a bath containing nickel chloride and hydrochloric acid. The final procedure is silver plating from a cyanide-thiourea bath. The thickness of the silver layer is adjusted by the silverplating time. The procedures are described in detail. Test results indicate that the procedure provides superior resistance to weathering, so that microwave chains outdoors will operate without adjustment for a long time. The silver layer deposited in this manner adheres well, has uniform thickness, and protects the filter parts against all climatic effects. Figures 7, tables 2.
[98-2542]

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AN EXPERIMENTAL AUTOMATIC MEASURING SYSTEM FOR TESTING OF VIDEO CHANNELS

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STEFLER, SANDOR, Experimental Institute of the Postal Service

[Abstract] The measuring system described, based on a Rohde and Schwarz UFP instrument for automatic evaluation of the video channels during program transmission and a HP 97/S calculator for controlling the measurement processes, requires a test line (preferably the 17th row) with white reference in the input signal. It measures 1) The video-signal amplitude deviation; 2) The peak drop of the white reference pulse; 3) The rounding off of the white reference pulse; 4) The amplitude difference of the white reference pulse and the 2T pulse; 5) The amplitude difference of the low-frequency component of the 20T pulse and 50 percent of the white reference pulse; 6) The deviation of the auxiliary color carrier 20T pulse component from the white pulse; 7) The group running time of the auxiliary color carrier relative to the low frequencies; 8) The amplitude ratio of the first auxiliary color carrier pack in the test signal of the 331st line and the white pulse; 9) The deviation from nominal of the amplitude of the line sync. signal; 10) The deviation from nominal of the amplitude of the auxiliary color carrier; 11) The shift of the gray level in the 331st line from the nominal amplitudes in the individual auxiliary color-carrier packs; 12) The effective value of the noise frequency related to the white reference amplitude; 13) The full differential gain measured in the 330th line; 14) The full differential phase measured in the 330th line; 15) The static nonlinearity measured in the 17th line; 16) The maximum amplitude of the auxiliary color carrier packs to that of the extinguishment level; 17) Same as No 16 but for minimum amplitude; 18) The maximum running time; 19) The minimum running time, and 20) The code number of the test channel. These parameters are determined by means of level measurements according to CCIR recommendations at significant points, and forming differences and ratios. The results are displayed digitally, and may be transmitted and processed further. Means for expanding the system are provided. Experience with the system over several years was favorable. Figures 11, references 9: 1 German, 2 Hungarian, and 6 Western. [98-2542]

UDC: 621.3.029.6:621.3.049.772.2

SUBSTRATES, METAL-LAYER STRUCTURES FOR MICROWAVE THIN-FILM INTEGRATED CIRCUITS

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VERTESY, MIKLOS, and DUCZA, ISTVAN, Telecommunications Research Institute

[Abstract] The authors review the state of the art, on the basis of references in the literature, in the following subject areas: (a) substrate materials for microwave thin-film circuits, (b) resistance layers of microwave thin-film circuits, (c) conductor layers of microwave supply lines, and (d) metalization techniques. An agreement was concluded between the TKI [Telecommunications Research Institute] and the HIKI [Research Institute for the Communications Industry] in 1976 for research, development, and experimental manufacture of thin-film circuits on ceramic substrate for use in third-generation microwave radio-relay equipment. The jointly developed program supports Hungarian manufacture of dielectric-backed microwave circuits. A film system was developed to provide versatile use in both microwave equipment and units operating at lower frequencies. This system has the following individual layers: substrate - resistance layer - adhesion layer - diffusion barrier layer - conductive layer. The diffusion barrier layer (NiCr) is sputtered, and at the last stage of the deposition process, sputtering of the gold conductive layer begins gradually, so that there is a gradual transition from NiCr to Au for improved mechanical bonding and easier subsequent galvanization of the top gold layer and later soldering processes. The adhesion layer is sputtered titanium and the resistance layer is atomized Ta_2N. The substrate is specially treated Al_2O_3. Trial manufacture of microwave amplifiers, filters, frequency dividers, directional couplers, and the like demonstrated the usefulness and suitability of this layer system. Figures 5; references 20: 5 German, 3 Hungarian, and 12 Western.

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CALCULATION OF THE DAMPED FADING DEVELOPED AS A RESULT OF A CHANGE IN THE REFRACTION-INDEX GRADIENT

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CSERNOCH, JANOS, Orion

[Abstract] One type of fading encountered in ground-to-ground microwave transmissions is damped fading caused by changes in the refraction-index gradient. The phenomena involved include partial or complete reflection caused by altitude inversion and a deflection of the radiation direction. Propagation measurements and Fresnel formulas may be used to calculate the first phenomenon. This article discusses calculation of the results of the second phenomenon, where the beam is continuously deflected with the gradual change in the atmospheric index of refraction. In this case the continuity of the beam is maintained even as the meteorological conditions change, only the configuration of the beam undergoes a change. Under such conditions supplementary damping may develop, especially if the main beam of the antennas is narrow (less than plus or minus 0.4 percent). This effect can be minimized by keeping the main-beam width at G = 45-48 dB. The distribution and climate-dependence of the index of refraction should be known for designing a transmission system. In ground-to-satellite connections, damping may develop as a result of oxygen or water-vapor condensation, fog, and clouds. In case of large antenna apertures, even a small change in the behavior of the index of refraction with altitude may cause amplitude and phase scintillation. Expressions were derived for calculating the effects from measurable parameters, and a comparison was made between measured and calculated values. Satisfactory agreement was noted. Figures 4; tables 6; references 10: 2 German, 1 Hungarian, 1 Czechoslovak, 1 Japanese, and 5 Western.

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NEW TYPES OF AUDIOFREQUENCY TERMINALS IN TRANSMISSIONS

Budapest HIRADASTECHNIKA in Hungarian Vol 31, No 1-2, 1980 pp 61-66

SIMON, LAJOS, TERTA [Telephone Factory]

[Abstract] The mechanical and electrical design of 2/4 wire audiofrequency terminals developed at TERTA for large stations was described and illustrated with photographs and circuit diagrams. The logical circuits and some of the switches are made of discrete solid-state devices, and in areas where circuits must be electrically isolated or low transitional resistance is required, dependable, small-size relays are used. Three modes of operation are available (two-wire speech transmission and a.c. signal transmission over the speech wire; two-wire speech transmission and two separate wires for signal transmission via ground potential; four-wire speech transmission and two separate wires for signal transmission via ground potential); speech transmission is four-wire toward the channels in all three modes. Special types of audiofrequency terminals described and illustrated include: a CB center side terminal which connects the four-wire carrier channel to the two-wire telephone center; a CB subscriber terminal which connects the four-wire carrier channel to the subscriber telephone unit; and K-type terminals with two operating modes differing in the manner the signals from the exchange are processed. The transmission frequency band is generally 300 to 3400 Hz. Detailed technical specifications are given in tabular form. Figures 11.

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INFLUENCE OF WELD PROPERTIES IN HEAT-AFFECTED ZONE ON RESISTANCE TO COLD-CRACKING

Budapest GEP in Hungarian Vol 32, No 5, May 80 pp 186-191

TURI, ALADAR, Dr. of engineering sciences, and EL-HEBEARY, M. R., candidate of engineering sciences, Research Institute of the Ferrous Metallurgical Industry, Budapest

[Abstract] Tests were carried out on Mn-alloyed and V, Ti, and Nb-microalloyed steels with carbon equivalents of 0.41, 0.45, and 0.48, using notched and unnotched specimens, to determine the resistance to cold-cracking by means of implant tests. The specimens were heat-treated in various ways and the effects of the characteristics of welds in the heat-affected zone were assessed. There was a linear relationship between the resistance to cold cracking and hardness in the heat-affected zone. Higher yield stress in the heat-affected zone corresponds to lower resistance to cold-cracking. The hydrogen content in the heat-affected zone also influenced resistance to cold-cracking. The overall effect of these characteristics showed that static fatigue phenomena are minimized if the welding parameters were such that the microstructure was close to that of the equilibrium state, even if the diffusive hydrogen content was relatively high and the stress approached the yield stress. If there was major deviation from the equilibrium state, even the base steel exhibited decreased resistance to cold-cracking. The carbon equivalent affected the hardness in the heat-affected zone (lower carbon equivalent went with higher hardness) and thus indirectly also the resistance to cold-cracking. The maximum hardness in the heat-affected zone had a more pronounced effect than the average hardness. Figures 10; references 5: 3 Hungarian and 2 Western.

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MICROPLASMA WELDING

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LIEBISCH, H., head of the Technical Center, Secheron de Soudure SA (part of Oerlikon-Buehrle Holding AG), Switzerland (the article was edited and translated by VIZKELETY, KALMAN, welding engineer, Universal Kft [Limited])

[Abstract] The development and the state of the art in the field of microplasma welding equipment, procedures, and applications were reviewed briefly. The plasma-welding equipment uses various current levels. The current significantly affects the properties of the arc so that the application technologies become quite different. The current source is basically a magnetic amplifier, equipped with main and auxiliary arc rectifiers, control unit, and gas system. The plasma burner, connected with a special hose to the unit, features a tungsten electrode (with thorium) and a ring. The auxiliary arc is used only to ignite the main arc; however, in the range of very low current densities, it is needed to keep the main arc burning. The arc-constriction mechanism contributes significantly to the performance of the plasma burner. In selecting the gases, special attention must be given to their thermal conductivity characteristics, as well as their reactivity with the material to be melted and the atmosphere. Hydrogen is usually mixed with inert gases for best constriction effect. Current microplasma welders are sufficiently long-lived, so that their industrial use is now practicable. Spot-welding, butt-welding, and corner welding are already used on an industrial scale. Some examples were described. Figures 19.

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